

## APPENDIX 2 – LOLO NATIONAL FOREST PLAN OLD GROWTH MONITORING FINDINGS

### INTRODUCTION

Since 1986, the Lolo National Forest has conducted monitoring of its old growth treatments to assess compliance with the Forest Plan.<sup>1</sup> The monitoring program has allowed the Forest to correct deficiencies in old growth treatment prescriptions and has been instrumental in the evolution of the Forest's longer term old growth management policies.

### FOREST PLAN MONITORING FINDINGS

#### 1986 to 1987

In the first two years following the Forest Plan's 1986 Record of Decision, no allocated old growth (MA 21) was treated across the Forest.

#### 1988

In 1988, the Forest's review of its old growth treatments found that all treatments in MA 21 were compatible with the Forest Plan's old-growth standards.

#### 1989

In 1989, three sales were sold which treated MA 21 under an old growth enhancement strategy. These included the *Big Bear Salvage Sale*, which treated 56 acres of MA 21, the *Sevenmile Sale*, which treated two units at 24 acres and 57 acres each, and the *Miller Mountain Sale*, which treated 33 acres of MA 21. All units were treated under an old growth enhancement strategy developed by the Forest Wildlife Biologist.

Two units from the *Butte V Cloudburst Sale* were also harvested in 1989. This sale was sold prior to the adoption of the Forest Plan, thus proposed treatments did not follow the standards outlined in the new Plan. During timber sale "buy-back" negotiations, the Forest adjusted the unit prescriptions to be compatible with the Forest Plan's MA 21 allocation. Final harvest treatments involved removing a subalpine fir understory from beneath an extremely decadent overstory of larch. Prior to harvest, over 50% of

the larch overstory was dead. The objective of the treatment was to regenerate larch and Douglas-fir while maintaining the existing old growth larch overstory. Post harvest reviews indicated that all of the larch and larch snag overstory was protected.

#### 1990

Only two MA 21 units were harvested in 1990, including one unit from the *Butte V Cloudburst Sale* and one unit from the *Coney Sale*.

As previously described, the *Butte V Cloudburst* unit was part of a sale which was designed before the Forest Plan. After the sale sold, unit prescriptions were modified to meet the Forest Plan MA 21 allocation. The stand that was treated was an extremely old (600+) larch stand with a high level of decadence and mortality. It was estimated that 40% of the overstory was dead or would die within 5 years. The remainder of the overstory was very old but was not considered to be at risk for imminent mortality. The understory was composed of subalpine fir, Douglas-fir, and lodgepole pine. Dead and down tonnage was a desirable 20-30 tons/acre. Snags were abundant at about 15/acre. The habitat type was subalpine fir/clintonia. Although the site was superb old growth in an untreated condition, a silvicultural analysis indicated that within a century the stand would totally convert to a climax stand of subalpine fir, with a minor component of Douglas-fir. The analysis determined that larch snags might persist for longer but would ultimately disappear from the stand. The recommended old growth treatment was an understory removal. Fuels were left on site. All snags were protected in the contract by the reserve tree clause as were the larch overstory trees.

Post sale monitoring measured remaining overstory trees, snags, and dead and downed material, and compared this against pre-harvest data. There was no measurable difference in any of those parameters between pre-harvest and post-harvest data. None of the standing snags were lost with the harvest. The results were attributed to the relatively short cable yarding distance (400' maximum), and special effort made by the sale administrator to protect the units old growth

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<sup>1</sup> Forest Plan Monitoring Reports, 1987-2001.

characteristics. The 1990 monitoring report indicated that the understory would be planted to larch and Douglas-fir in the spring of 1991. Following treatment, the access road was also physically blocked to insure that woodcutters would not have access to the site. The 1990 report summarized that there was a loss of the understory with a short-term loss in old growth productivity. The monitoring report concluded that because the understory will be replaced by a seral understory, the larch/Douglas-fir community will be perpetuated. In the long run, this will result in a better old growth stand than what would have occurred without manipulation.

The unit harvested within the *Coney Sale* was a mature lodgepole stand that had scattered young larch. The unit was part of a large block of MA 21. The prescription recommended that all trees be removed except the larch. Those trees were protected contractually by a reserve tree clause. The *Coney Sale* was reviewed by the Forest Plan Monitoring Team. While the prescription was designed to recruit desirable seral species (larch), it was not clear to the monitoring team whether the treatment was appropriate due to the lack of: 1) an age class and condition analysis of the remaining MA 21 area; 2) a similar assessment of the availability of unsuitable old growth in the area; and 3) a clear set of management objectives for the MA 21 area. The loss of the mature lodgepole constituted a long-term loss in stand structural characteristics. The Forest Plan Monitoring report assessed that it would take 60-80 years before the new stand begins to replace the existing stand from an old growth standpoint, and 120-180 years before it starts to develop old growth characteristics.

Because the 1986 Forest Plan did not provide for old growth recruitment via total regeneration of MA 21 stands, it was felt by the monitoring team that this treatment did not meet the Forest Plan goals for MA 21 under the current strategy.

The results of the 1990 monitoring indicated that MA 21 goals were not fully understood during project design and hence weren't being fully met.

As described earlier in *Old Growth Management*, the 1990 monitoring efforts prompted the forest to temporarily suspend management of MA 21, establish an inventory of old growth across the Forest, and assign a committee of Forest personnel to examine the relationship of old

growth to stand recruitment, ongoing research and other agency efforts.

## 1991

In 1991 the *Old Growth Committee* was established to review and approve all proposed treatments in MA 21.

In fiscal year 1991, several Forest guidelines were also issued to protect old growth by: 1) precluding harvesting of old-growth ponderosa pine stands unless approved by the old growth committee; 2) permanently retaining seed and shelterwood trees in final overstory treatments for their value as snags, woody debris, and nutrient cycling; and 3) protecting old-growth stands that were ecologically unique, such as old growth red cedar or mountain hemlock. These directives were outlined in two Forest Supervisor's memos.<sup>2</sup>  
<sup>3</sup>

No sales sold in FY 91 included MA 21, although several out year sales that were being planned included MA 21 that had been approved for treatment by the old growth committee. By the end of 1991, the committee had reviewed five projects that contained MA 21 areas and old-growth ponderosa pine communities. Vegetative enhancement prescriptions were refined and approved for three of those projects.

### 1991 Old Growth Committee Project Review

**Cherry Helio Timber Sale** – approved understory removal of Douglas-fir to recruit bull pine.

**Deep Gilman Timber Sale** – approved understory removal of Douglas-fir to protect old growth ponderosa pine from stand replacement fire.

**Rd #4328 Timber Sale** – approved species designation removal of lodgepole pine from a MA 21 stand to improve the growth of larch and accelerate its development to old growth status.

**West Mount Timber Sale** – limited treatment to prescribed underburning based on the full stocking of ponderosa pine and small size of Douglas-fir encroachment.

<sup>2</sup> 2/11/91 Forest Supervisor's memo.

<sup>3</sup> (Daniels, 1920/2600, 2/11/91)

## 1992

In 1992, the old growth committee reviewed seven projects. Four of the proposed harvest treatments were deferred. Several projects were modified to focus treatments on understory removal or burning to enhance old growth.

### 1991 Old Growth Committee Project Review

**Cloudburst Post Timber Sale** - decision was to defer harvesting, however the EA listed 4 examples under which MA 21 could be treated.

**Deep Gilman Timber Sale** - approved understory removal of Douglas-fir to protect old growth ponderosa pine from stand replacement fire.

**Whitehorse Timber Sale** - four old growth management alternatives originally developed. Manager's decision was to treat most of the stands specifically to maintain OG character based on several recommendations including those offered by researcher, Steve Arno.

**West Stark Mtn. Timber Sale** - defer all harvest, recommend underburning only. Some tree felling may occur to provide fuel bed for burning.

**Tucker Gulch Timber Sale** - defer treatment within this stand. It meets old growth criteria. Also there is a deficiency of old growth in the area. There is currently no risk of loss identified for the stand and no immediate treatment needs were identified to enhance or maintain old growth.

**Cave Point Timber Sale** - defer treatment. Consensus that stand is functioning as old growth and there is not immediate need for treatment.

**Tujo Timber Sale** - Seven stands reviewed, four are marginal old growth. OK to treat these four. One other stand was recommended for treatment to maintain and enhance old growth character. Two stands were identified as needing landscape analysis for treatment as they are currently not achieving Forest Plan objectives of a healthy forest and are providing resource needs such as winter range.

## 1993

In 1993 the old growth committee reviewed two Ecosystem Management Area analyses on the Seeley Lake Ranger District. Following the review, additional old growth allocations were made to MA 21 and a Forest Plan Amendment (No. 20) was completed to display these changes.

### 1993 Old Growth Committee Project Review

**Salmon EMA** - the committee recommended an additional allocation of MA 21 to bring the ecosystem management area (EMA) up the Forest's 8% standard. See Amendment 20.

**Morell EMA** - the committee recommended limited treatment within a large old growth stand of western larch/Douglas-fir to reduce potential loss to stand replacement fire. Another stand along Morell Creek was felt to be developing adequately without treatment.

**Stark Horse Timber Sale** - several landscape level prescriptions to restore old growth stand structure were functioning as old growth and that there was no immediate need for treatment.

## 1994

No timber sales were sold in 1994 that included harvest within MA 21. During review of the *Glidden Timber Sale*, numerous questions arose over the old growth analysis that was used for the project, NEPA disclosure, and the MA 21 revision process. The old growth committee was assigned the task of developing strategies for addressing issues that were identified during the project review. Alternatives for assessing old growth and documenting changes to MA 21 were presented to the management team, and in April, 1994, the Forest Supervisor documented Forest Plan implementation guidance for old growth in a memo.<sup>4</sup>

## 1995

In 1995, the forest resumed harvesting timber within MA 21 based on an improved understanding of the dynamics of old growth stands, particularly those in low elevation, high frequency fire regimes. The old growth review committee was formally disbanded, although the members of the committee continued to advise the Forest on project design. Five of the seven sales offered in FY 95 include significant amounts of old growth, some of which were within MA 21. All treatments were reviewed to determine if old growth objectives were optimized by treatment. In all cases, silvicultural treatments were found to be compatible with the goal of optimizing both short and long term old growth values.

### 1995 Old Growth Evaluation

**Camelot Timber Sale** - Treatments were determined to be beneficial. While most old

<sup>4</sup> (Daniels, 2070/1950, 4/29/94:

growth had been removed decades earlier, thinning and single tree selection harvests in young ponderosa pine/Douglas-fir/larch stands were determined to help recruit old growth for the future and reduce the probability that such young stands would succumb to insects or stand-replacing wildfire.

**Mosquito Timber Sale** – No old growth treated.

**Cave Point Timber Sale** – Treatments were determined to be beneficial. A large stand of old growth ponderosa pine / Douglas-fir was found to be doing well in terms of resistance to insects, disease, and wildfire. Hence, no treatments were prescribed. Adjacent younger stands were treated with selection harvest to maintain growth and to ensure improved stability at the landscape level.

**Starkhorse Timber Sale** – Treatments were determined to be beneficial. Large blocks of MA 21 old growth were treated to reduce stocking levels to reduce the risk of loss to insect, improve survivability of trees to wildfire, and restore natural stand structure.

**Marshal Coop Timber Sale** – No old growth treated.

**McHenry Timber Salvage Sale** – Treatments were determined to be beneficial. All old growth ponderosa pine stands that burned in the 1994 wildfire event were retained. All large, scattered dead ponderosa pine, larch, and Douglas-fir within mixed coniferous stands were retained at 8-12 trees/acre to meet long term snag opportunities, woody debris, and nutrient recycling needs.

**Border Peak Timber Sale** – Treatments were determined to be beneficial. Old growth ponderosa pine stands were thinned from below to reduce the risk of loss to insects or stand replacing wildfire. No old growth ponderosa pine trees were removed. Trees removed were predominately small diameter Douglas-fir.

**Northside Timber Sale** – 80 acres of very old Douglas-fir that was infested with root rot was treated. Treatment was designed to start introducing more root-rot-resistant species to the site. About 420 acres were classified as meeting or nearly meeting the R1 old growth standards. Treatments were designed to reduce risk of stand replacing fire and to restore the open grown structure that was typical of this forest type prior to fire suppression.

**Blue Ridge Timber Sale** – No old growth stands were identified within the sale area. The sale was designed to retain large legacy trees.

**Starkhorse Timber Sale** – Large blocks of MA 21 old growth were treated to reduce stocking to reduce the risk of loss to insects, to improve the survivability of trees to wildfire, and to restore natural stand structure and species composition.

**Hinchwood Clark Timber Sale** – No old growth in sale.

**Guinea Hen Timber Sale** – No old growth in sale.

**Archibald Timber Sale** – Treatment for two old growth stands in the foothills was considered but dropped because the stand was within the range of natural variation in terms of structure. One large stand in the valley bottom was treated to remove the understory that would carry fire into the crowns of very old larch and to reduce competition for light and space for old trees.

**Morrell Timber Sale** – Much of the old growth in the sale area was wetter forest that is naturally continuous and multistoried. Fuel breaks outside this area provided some protection from fire that might move toward the stand from the powerline, the highway or town. An old stand of pine on the dry, west facing slope above the highway was treated by removing the understory to reduce fire risk and to restore the more open structure typical of dry sites.

## 1996

Four of the eight large sales offered in 1996 include old growth treatments, some of which were within MA 21. All treatments were reviewed to determine if old growth objectives were optimized. In all cases, silvicultural treatments were found to be compatible with the goal of optimizing both short and long term old growth values.

### 1996 Old Growth Treatments

**Black Mtn. Timber Sale** – No old growth was treated.

## 1997

The four sales that treated old growth in 1997 differed in their effects. All treatments in low-elevation dry forest were considered to be beneficial to old growth. In one case, the treatment may have been too conservative to have been effective in achieving its old growth enhancement goals.

In the higher elevation forests with a mixed fire regime, two timber sales were planned to include old growth treatments. A review of the sales indicated that both the *Chipmunk* and *Reprise Timber Sale* included treatments that would have

had some short term negative effects. However, the treatments prepared the areas for fire which is a long term benefit.

In two of the sales developed in 1997, a full old growth analysis was not completed. On the Chipmunk Sale, old growth analysis had not been completed to the standard outlined by the 1994 Old Growth Strategy because the sale planning had pre-dated the 1994 Strategy. The sale was modified to drop treatments in old growth. In the other timber sale (West Fork Gold Creek), the Lolo conducted a salvage sale without quantification of old growth or allocation of MA 21.

As a result of these reviews, the following two recommendations were provided to the Forest Leadership Team regarding old growth assessments: 1) *For Forest Plan revision, the trigger for further evaluation should be changed to be consistent with current philosophy and standards for managing old growth.* 2) *Effects of management to old growth should be considered for small sales and initiatives like the salvage legislation. If the EMA has not been analyzed and no MA 21 has been designated, the Lolo should conduct a brief analysis of the EMA level status of old growth before treatment of late mature or old forest.*

Our of the 11 timber sales offered in 1997, three treated old growth.

#### 1997 Old Growth Treatments

**Lolo Cloudburst Timber Sale** – No old growth treatments were proposed.

**West Fk Gold Salvage Helio Sale** – No old growth treatments. No MA 21 had been designed in the EMA, which had only 20% NF ownership. Very little mature, old, or downed wood is left on the 80% private land. An old growth analysis was completed for Forest lands within the EMA.

**Dick Creek Salvage Sale** – No old growth treatments were proposed.

**Beaver Slough Salvage Sale** – No old growth treatments were proposed.

**Deer Peak Helio Salvage Sale** – No old growth treatments were proposed.

**Swamp Buggy Salvage Sale** – No old growth treatments were proposed.

**Reprise Timber Sale** – 241 acres of dry old growth MA 21 forest were treated. Another 59

acres of saf/df/wl old growth MA 21 forest were treated. The EMA is made up of 17% old growth, exceeding the 8% Forest Plan standard. In the dry site areas, the project thinned from below to remove the understory vegetation. Approximately 78 acres of this treated type met the old growth criteria. In the wetter SAF/DF/WL forest, 59 acres were treated to prepare for an underburn by removing the dead LP. There were some short-term negative effects from snag loss. 72 acres met or nearly met the old growth criteria.

**Chipmunk Timber Sale** – No old growth treatments occurred under this sale. The harvest treatments proposed in old growth (based on 1991 analysis) were dropped. Two units (37 acres) that were treated were potential old growth. Because the analysis was done in 1991, no larger scale (EMA) analysis had been done to put the old growth within the analysis area into a landscape context. Because old growth is short in the larger Prospect EMA, the treatments in potential old growth would probably not be done today without clear benefit to old growth recruitment.

**Henry Salvage Sale** – No old growth treatments occurred under this sale.

**Cave Helio Timber Sale** – Approximately 183 acres of MA 21 old growth were treated. The treatments included small group selections that were designed to remove some understory vegetation, reduce ladder fuels and reduce competition. The treatments, however, may not have been extensive enough to accomplish these goals. No old growth trees were harvested. No stands were altered so that they no longer met old growth criteria. The treatment in recruitment old growth should promote rate of growth and move these stands closer to meeting the old growth definition. The EMA retains 18% of the area in old growth, exceeding the Forest plan standard for 8%.

**Reset Timber Sale** – No old growth treatments were proposed under this project.

#### 1998

The Lolo Forest Plan allows treatments like burning and logging in old growth forest. In this monitoring item, these treatment are assessed by Forest biologists for any detrimental effects on old growth quality. In some forest types, removal of understory and underburning may occur in stands that reduce competition and the threat of stand replacing fire. These treatments are beneficial to old growth quality.

For each sale, district Biologists described and assessed the quantity of old growth treated and effects on old growth. The results are displayed for all areas that are designated old growth in the

FP (MA 21) and other acres that meet the R1 definition of old growth for a specific forest type (RIOG).

Old growth stands were treated in two of the four sales

#### 1998 Old Growth Treatments

**Moccasin Timber Sale** – Approximately 490 acres of old growth were planned for treatment in stands that met or nearly met the old growth criteria. All 490 acres were planned with a combination of understory removal, thinning, and underburns to restore natural structure, reintroduce fire, and protect the stands from stand replacing fire. Treatments were designed to optimize old growth values in ponderosa pine communities.

**Canyon Face Helio Timber Sale** – All of the old growth in this sale is ponderosa pine that meet the RIOG definition but is not in designated MA 21. Twelve acres will have the understory thinning (removing mostly Douglas-fir and smaller pine) and then be burned. Twenty three additional acres will be treated only by an understory burn. All activities were designed to restore historic structure (open stands of large trees with little understory) and to benefit old growth quality by reducing fire hazard, reducing competition, and restoring habitat for species that evolved using this open forest.

**Tujo Helio II Timber Sale** – No old growth treatments were proposed under this sale.

**Twomile Helio Timber Sale** – No old growth treatments were proposed under this sale.

All activities completed in old growth in 1998 focused on restoring the vegetative structure typical of low elevation forest before fire suppression began. The large old trees were retained and understories were removed or thinned to reduce fire hazard and reduce competition. No “degradation” of old growth quality or reduction in amount of old growth occurred.

#### 1999

Two of the four sales sold in 1999 included old growth treatments.

#### 1999 Old Growth Treatments

**Chain of Lakes Timber Sale** – Although this sale included old growth treatments, none of the treatments occurred within MA 21. Virtually 100% of the stands treated had residual old growth trees. One stand met RIOG definitions in terms of an adequate

number of large trees/acre. No old growth trees were harvested. Treatment was limited to partial to total understory removal. This is consistent with the historic fire dependent stand structures as defined by Arno (pers. com).

**Sunny Side Helio Timber Sale** – This sale did not include old growth treatments, however, it did focus on restoring old growth to the area. All of the old growth in this landscape was presumably removed near the turn-off-the-century by horse logging. All treatment prescriptions involved retaining pole-sized ponderosa pine, removing competing Douglas-fir, and reintroducing low intensity fire. This treatment was fully compatible with recruiting old growth ponderosa pine on droughty low elevation landscapes.

**Rivulet Timber Sale** – This sale did not include old growth treatments. Old growth stands are in short supply in this landscape due to a combination of the 1910 fire and timber harvesting in the late 60s. Consequently no old growth stands were treated.

**Billy Helio Timber Sale** – This sale did not include old growth treatments. Like the Sunny Side project, all of the old growth in this landscape was presumably removed near the turn of the century by horse logging. All treatment prescriptions involved retaining pole sized ponderosa pine, removing competing Douglas-fir, and reintroducing low intensity fire. This treatment is compatible with recruiting old growth ponderosa pine on droughty low elevation landscapes.

**Wee Teepee Helio Salvage Sale** - 578 acres of old growth pp/df were enhanced – 327 acres were treated with an understory removal followed by underburning and 251 acres were underburned. Understory removal was consistent with presettlement old growth stand structures (Arno pers. comm., Fischer and Bradley 1987).

In 1999, Forest Wildlife Biologists evaluated two other projects that were implemented for old growth enhancement across the Forest. These included the Whitehorse timber sale, sold in 1993, in which prescribed burning was completed in 1999; and the Ranch Creek prescribed burn completed in 1999.

The Whitehorse project included approximately 500 acres dominated by old growth ponderosa pine, western larch, and Douglas fir. Selective logging removed the understory and some dominate large Douglas-fir in the mid 90s. Prescribed burning was completed in May 1999. Post burn survey concluded that the live tree stocking was 100-120 square feet (optimal according to Arno for long-term survival of old growth ponderosa pine and western larch) and the

snag density was 5-7 snags/acre (roughly triple the level specified in the 1996 snag standard). On the negative side, 12 acres suffered a stand replacing burn, which killed most old growth trees on those acres. While mortality was outside the burning prescription, this mortality is considered well within the normal conditions expected for large landscapes of low elevation old growth.

The Ranch Creek project included 500 acres of prescribed burning that was conducted in a stand of old growth ponderosa pine with a dense Douglas-fir understory. Post burn surveys indicated that the Douglas-fir understory was killed on 70-80% of the landscape. This substantially improved the stands ability to survive wildfires. Scattered mortality (1-2 trees/acre) of old growth ponderosa pine occurred on 40% of the landscape. This recruited snags at the normal average density for low elevation landscapes according to the 1996 snag standard and reduce stocking slightly which should improve the stands resistance to insects and disease according to Arno, Scott, and Hartwell (1995). On the negative side, 5 acres suffered stand replacing burn, which killed most old growth trees on those acres. While this mortality was outside the burning prescription, this mortality is considered well within the normal conditions expected for large landscapes of low elevation old growth.

The 1999 Forest Monitoring Report concluded that activities in old growth across the Forest focused on restoring the structure typical of low elevation ponderosa pine, Douglas-fir, and mid elevation western larch/Douglas fir forests before fire suppression began. The large old trees were retained and understories were removed or thinned to reduce fire hazard and reduce competition. The 17 acres of mortality from burning (12 acres on Whitehorse and 5 acres on Ranch Creek) should be considered unavoidable tradeoffs when restoring fire dependent communities in which fires have been suppressed for over 70 years. Overall, no degradation of old growth quality or reduction in the amount of old growth occurred at the stand level.

The Wee Teepee Helio Timber Sale was a typical example of old growth restoration for the Lolo, and is also very representative of the Lolo's ecosystem management driven timber program. Attributes of Wee Teepee included: helicopter access and road eradication to avoid introducing

noxious weeds, to protect big game security, and to avoid sediment related impacts; improvement cuts designed to restore natural stand structures; and reintroduction of low intensity burns.

The Chain of Lakes project was less typical since it involved old growth western larch in a landscape dominated by summer homes and intensive recreation activities. While the projects emphasis was focused on protecting homes from fire and maintaining recreational values, the treatments were fully compatible with protecting old growth larch, some of which were 600 to 900 years old. While the Billy Helio and sunny Side Helio projects had no old growth, the treatments were fully compatible with recruiting old growth ponderosa pine on droughty low elevation sites.

## 2000-2001

Between 2000 and 2001, five projects across the Forest included old growth treatments. None of these treatments occurred in MA 21. All treatments were designed to enhance or maintain old growth characteristics.

### 2000-2001 Old Growth Treatments

***Mosquito Helio Timber Sale*** – Approximately 77 acres were treated to enhance old growth under this timber sale.

***Boyer Salvage Sale*** – No old growth was treated under this sale.

***Arch Inez Timber Sale*** – Two stands were harvested under this sale that met the old growth criteria. Treatment prescriptions included the removal of the understory in order to reduce fuels and feature the large old trees.

***Clearwater Stewardship Timber Sale*** – No old growth was treated under this sale.

***Key Pole Salvage Sale*** – Approximately 531 acres of the 3,442 acres treated under this sale enhanced old growth characteristics. Key Pole Salvage was in the Superior North NFMA analysis where old growth was designated to equal 8% of the total for three EMAs. Treatments in the existing old growth included 136 acres of burning, 334 acres of improvement cuts, and 61 acres of individual tree selection. The objective of these treatments was to restore and develop late seral forest conditions similar to the historic disturbance regime by leaving the large old trees and treating the understory vegetation.

***Shapes and Feathers Timber Sale*** - 43 acres of irregular shelterwood cutting designed to retain old growth characteristics and 20 acres

*of small patch seed tree cuts out of 1600 acres of suitable old growth were treated.*

**Petty Rock Helio Timber Sale** - 352 acres of old growth selection cutting was completed to enhance old growth characteristics. In Petty Rock Helio a selective harvest of smaller merchantable understory was prescribed to increase growth of the remaining stand and reduce ladder fuels that place the old growth at risk.